# Pacific Seabird Group

# BULLETIN

Volume 7 Number 2 Winter 1980

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PACIFIC SEABIRD GROUP
BULLETIN

Volume 7 WINTER 1980 NUMBER 2

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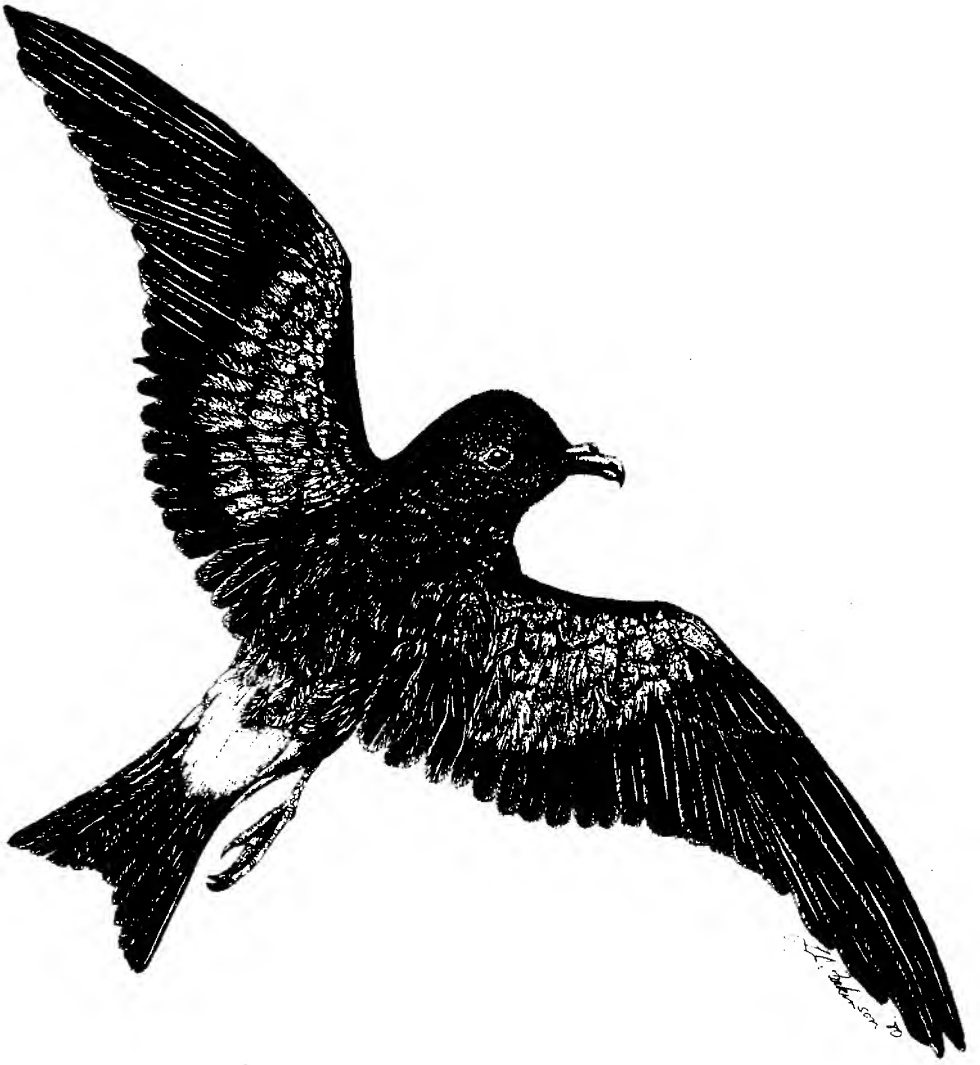


THE EDITOR'S PAGE

A few weeks ago I received a copy of Volume 4: Marine Birds of the series Behavior of Marine Animals (see NEW PUBLICATIONS). Chapter 1, Seabirds as marine animals, by Richard Brown is a general review of avian marine ecology, but there is no reference to the vast amount of recent work done in Alaskan waters. After reading next Bill Bourne's review of Conservation of marine birds of northern North America in the recent Ibis (reproduced in this issue of the Bulletin), I concluded that the results of the Alaskan work are not reaching the outside world.

It will be a great loss to our understanding of the biology of marine birds if this information doesn't become part of the scientific literature. Who is responsible for seeing that it is not lost?

The NOAA/OMPA (formerly NOAA/OCSEAP) office, which has contracted for most of the field work, has dutifully published the reports of its investigators and distributed them to about 500 institutions and individuals. In addition, there have been series of synthesis reports and reports based on synthesis meetings. These documents, however, are unsatisfactory as scientific literature. They are part of a growing mass of "gray literature" which usually contain a notice to the effect that no one will stand behind the information presented. Although these publications are necessary and important interim planning documents, I think it is proper that they not be accepted as part of the scientific literature.

A recent "review of federal programs in environmental impact studies of petroleum in the marine environment" criticizes the Bureau of Land Management for neither encouraging nor providing funds for the publication of research results of its investigators in peer-reviewed journals. Since the NOAA/OMPA Alaska OCS Program receives all of its funds from BLM, one wonders how the BLM policy applies to NOAA/OMPA investigators. The report cited above implies that OMPA is more liberal with its funds. An indication that this is true is the publication by OMPA of a two-volume book on the current environmental knowledge of the Bering Sea. The authors have been given complete freedom to write for the scientific community. The first volume of the book is now ready for distribution, and the second (which will include the bird papers) should be out by the end of the summer. The Bering Sea volumes, however, do not include the vast amount of work done in the Gulf of Alaska and the Arctic

Ocean. There are no encouraging signs that the government will support publication of these studies.

I once asked a scientist working on OMPA research what his publication plans were. He assured me that he and several others were planning to publish their results as soon as the final reports were written. Since the field work on most of the OMPA projects has been over for one or more field seasons and final reports have been submitted (or are promised any day now), I hope that journal editors are being overwhelmed by manuscripts on marine birds. I wonder. Many of these researchers are now working on other projects, and most of them will explain the difficulties of working on contracts or mission-oriented research and trying to publish science. Their stories are true, but if they don't take the responsibility for publishing their results, who will?

It is too early to condemn these workers for not getting their findings into the scientific literature. Several papers have already been published, and over 50 papers based on this research have been given at PSG annual meetings. The time lag between the end of the field work and the publication of results is not yet as long as is typical of academic research. On the other hand, the concerns expressed by Bill Bourne are shared by many. It will be all too easy for new pressures and concerns to attract attention away from finishing up old tasks.

Perhaps PSG can help. There is now interest in having a PSG meeting in Alaska in three or four years. A symposium on Alaska marine bird research would naturally be part of such a meeting, and the timing would allow enough time for researchers to prepare solid papers. PSG could oversee the publication of a symposium volume which could include more data than most journals would include. This would be expensive, but PSG could probably do it more cheaply than anyone else. Some government funds would probably be needed.

I would like to hear from anyone concerning my remarks, Bill Bourne's review, and plans for an Alaskan marine bird symposium.

Joseph G. Strauch, Jr.
Editor

THE CHAIRMAN'S PAGE

During the past two years it has been my pleasure to serve as Chairman of the PSG. I trust that the PSG has benefited as I have through this involvement. The leadership now passes to the capable hands of Kees Vermeer. I hope he will feel as positively as I do about the PSG at the end of his term. As outgoing Chairman, I wish to make a few remarks about the PSG and seabird biology.

In order for the PSG to continue to be the outstanding research and conservation organization that we have evolved into, individuals must become and stay involved in the organization. We should strive to create an academic atmosphere of open communication and not get hung up on the petty details of rules and regulations. It takes real dedication to "get involved" with an organization and not just complain about what others are doing. We do need to get a clear idea of where the PSG is going and what purposes we want to serve. I personally believe that providing scientific data from which management decisions can be made is one of the major purposes that we can serve.

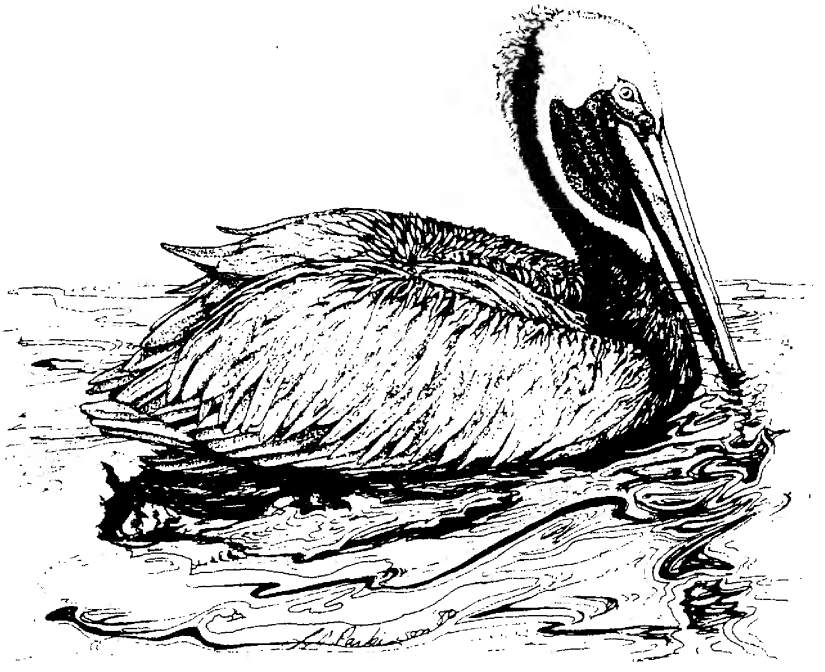
A very important aspect of seabird biology is just becoming known. In the past, short-term studies predominated in ornithology. While these studies (of only one season) can be used to answer some very specific questions (such as those regarding temperature regulation, for instance) only studies of a decade or more that follow individual birds will get close to the truth regarding aspects of breeding biology and population stability. These long-term studies are now coming into their rightful place. PSG members in a position to do so must make all efforts to inform bureaucrats of the necessity of funding for these long-term studies.

Plans for future meetings of scientific organizatons are going to have to be carefully made because of great increases in the cost of air travel. We should consider having meetings in conjunction with groups such as the AOU or Cooper Ornithological Society. Having the PSG meeting for 2-3 days prior to or after another meeting could provide many benefits in addition to saving money.

I want especially to thank Paul Springer and Betty Anne Schreiber for their assistance during the past two years in keeping the PSG functioning. Palmer Sekora provided excellent service to me and the PSG in his role as program chairman. I believe that Doug Siegel-Causey provided an excellent milieu for our Tucson meeting. It was one of the best get-togethers I have attended. I wish to thank Dr. Pete Lee (Director) and Dr. Fred Truxal (Chief Curator, Life Sciences), my bosses at the Natural History Museum, for allowing me to carry out my PSG duties and providing considerable logistic support. George Anderson of the Museum Print Shop provided his expertise to the society with his usual finesse.

I look forward to further communication within the PSG. I believe we have something special going in this organization. We must continue to provide the scientific outlet for the avian biology of the Pacific Basin.

Ralph W. Schreiber
Los Angeles, California
December 1980



## Eighth Annual Meeting

Initial planning has begun for the eighth annual meeting. We hope to have three full days for presentation of papers, with two days devoted to selected topics. The following have been suggested:

1. Feeding ecology of marine waterfowl,
2. Feeding ecology of pelagic marine birds,
3. Seabird - commercial fisheries interactions,
4. Human-induced mortality of seabirds.

If you have suggestions for other topics (and possible contributors), please write to the Program Chairman, Harry Ohlendorf (address inside back cover), by 1 April 1981. We expect to publish the papers presented in the special sessions. Manuscripts will be due before the meeting (probably in December 1981). In addition, there will be time for presentation of papers on other subjects at general sessions or at poster sessions.

Local Chairman, Lora Leschner, reports that arrangements have now been made to hold the meeting on 6-8 January 1981 at the Seattle Aquarium. Plans are developing for a banquet, wine-tasting session, and a trip to Blake Island for a salmon bake and a performance of Indian dancing. A field trip on Saturday is planned. Space has been reserved at the Edgewater Inn for the duration of the meeting. Registration forms and a call for papers will be mailed in August.

Harry Ohlendorf, Program Chairman
Lora L. Leschner, Local Chairman

## 1981 Dues and Revised Membership Directory

A revised membership directory is planned for the next issue of the Bulletin. The directory will be based on the returns of the membership renewal forms which you should receive shortly after you receive this issue of the Bulletin. A new feature of the directory will be the inclusion of members' telephone numbers. These will be requested on the renewal forms. Please return the forms and your 1981 dues as soon as possible.

## Moving Members

When a member moves and neglects to inform the Treasurer, the copy of the Bulletin sent to his old address is destroyed by the U.S. Postal Service, PSG must incur the expense of sending him another copy, and the member receives his Bulletin late. Don't let it happen to you. The only way the PSG can keep current with your local habitat is if YOU send us the address. Please, when you move or change mailing address, notify the Treasurer, B. A. Schreiber, 900 Exposition Blvd., Los Angeles, CA 90007, immediately.

## 1981 Election Results

Chairman: Kees Vermeer
Vice Chairman: Harry Ohlendorf
Secretary: Judith L. Hand
Treasurer: Betty Anne Schreiber
Regional Representatives: Northern California: Bob Boekelheide
Alaska: Margaret Petersen
Washington: Katherine Hirsch elected, but resigned because of change in residence. Dee Boersma appointed to seat by the Chairman.
Mexico: Monica Herzig-Zurcher
Non-regional Representative: Doug Siegel-Causey was appointed to fill the seat vacated by Judith L. Hand.

Call for Nominations for 1982

The bylaws require that the Secretary announce before May 1 of each year the seats on the Executive Council (exclusive of the Officers, who are nominated by the Executive Council) that will be open in the next calendar year. Nominations are to be received until June 1. Following are the regional seats on the Executive Council for which nominations are now open:

Regional: British Columbia, Oregon, Southern California

Non-regional (3 seats), to be filled by members not residing in Alaska, British Columbia, California, Hawaii, Mexico, Oregon, or Washington.

Regional and Non-regional Representatives serve 2-year terms on the Executive Council and may continue for successive terms. Current Regional and Non-Regional Representatives are listed on the inside of the back cover of the Bulletin. Although candidates for Chairman, Vice-Chairman (or Chairman Elect if the bylaws are changed), Secretary, and Treasurer are nominated by the Executive Council, the Council will be glad to receive suggestions for nominations for these offices from the membership.

Please send your nominations for all positions by June 1 to:

Dr. Spencer G. Sealy
Coordinator, PSG Election Committee
Department of Zoology
University of Manitoba
Winnipeg, Manitoba R3T 2N2
Canada

# PROPOSED CHANGES IN PSG BYLAWS

Original wording in ( ). Proposed changes with underlining.

## ARTICLE I. NAME, OBJECTIVES, AND COMPOSITION

Section 2. Objectives. - The objectives of the Group are exclusively (charitable) scientific, educational and (for the prevention of cruelty to animals) non-profit).

Explanation - to correctly describe the objectives of the Group.

## ARTICLE IV. OFFICERS

Section 1. Officers. - The Officers of the Group shall be a Chairman, a (Vice-Chairman) Chairman-Elect, a Secretary and a Treasurer. Any member in good standing may be elected to an office. The Executive Council with the exception of the Officers will serve as a nominating committee. The Officers will be elected by a majority vote of the membership voting in an election held at least 30 days prior to the annual meeting. Officers will serve for the succeeding year.

Explanation - The change from Vice-Chairman to Chairman-Elect was recommended by the Executive Council at the January 23-24, 1980, meeting in order to provide greater experience and continuity for the new Chairman. Also, it would be improper for the current Officers to nominate themselves.

Section 2. Chairman. - ...In the absence of the Chairman, or upon his inability to serve, duties shall be assumed by the (Vice-Chairman) Chairman-Elect.

Explanation - Change in title of this position as explained above.

Section 3. (Vice Chairman) Chairman-Elect. - The (Vice Chairman) Chairman-Elect shall be assigned duties by the Chairman. The Chairman-Elect shall succeed to the office of Chairman upon the completion of the Chairman's term of office.

Explanation - Change in title of position as explained above. Also, provision for succession from Chairman-Elect to Chairman.

## ARTICLE V. ELECTIONS AND FILLING EXECUTIVE COUNCIL SEATS

Section 1. Nominations. - Before May 1 of each year, the Secretary will announce in a Group publication or by card or letter the (seats on the Executive Council) regional and non-regional seats that will be open in the next calendar year. Nominations....

Explanation - The members nominate only persons for the regional and non-regional seats on the Executive Council. The Executive Council with the exception of the current Officers nominates the Officers. See IV.1. as modified above.

Section 3. Tenure. - Members (of the Executive Council) in regional and non-regional seats shall serve for terms of two calendar years.... Members (of the Executive Council) in regional and non-regional seats may serve successive terms.

Explanation - On the Executive Council only the persons in the regional and non-regional seats serve for terms of two years. The Officers serve for terms of only one year unless renominated and reelected. See IV.1. above.

## ARTICLE VI. MEETINGS

Section 1. Executive Council.

Clause C - Quorum. - (Seven) Nine members of the Executive Council shall constitute a meeting quorum for the transaction of business.

Explanation - With the increase in the Executive Council from 11 to 16 by the previous addition of the four Officers and the Bulletin Editor, the size of the quorum would have to be increased from 7 to 9 if a majority is desired.

THE PROGRAM CHAIRMAN'S COMMENTS
SEVENTH ANNUAL MEETING
Tucson, Arizona
November 19-21, 1980
Palmer C. Sekora

The Seventh Annual PSG Meeting was deemed successful by all participants. Fewer papers and attendees enabled 30-minute presentations and an informality seldom found at scientific meetings. It was most enjoyable to be able to meet and talk to most participants. Everyone whom I spoke with felt that the 30-minute presentations enabled a fuller presentation with ample time left for questions. Perhaps PSG should make these longer presentations standard for future meetings even if an extra day is required.

In comparison to last year's Executive Council meeting, this year's was quiet, subdued, and short. The main point of discussion concerned future meeting locations and dates. It was agreed that the next meeting will be held in January of 1982 in Seattle with Lora Leschner as local chairman and the following year in Hawaii with Craig Harrison as local chairman.

I wish to express my deep gratitude to Douglas Siegel-Causey, who served as local chairman. The time and effort spent in preparation were considerable, especially in light of the obstacles constantly presented by the local Student Union administrator. Thanks are also due his assistants, James Silliman, Mathew Leibold, Mary McKitrick, Sharon Goldwasser, and Don Kucera.

We also thank the Institute for Deserts and Oceans for allowing us use of their facilities at Puerto Peñasco, Sonora, Mexico, for the field trip. Activities included a fruitful pelagic trip, local birding on beach and desert, sharing festivities on the village square, and dining on local seafoods.

ABSTRACTS

## FORAGING DISTRIBUTION PATTERNS OF SHOREBIRDS IN THE GULF OF CALIFORNIA

Leibold, Mathew, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721.

Shorebirds wintering in the northern Gulf of California differ in their foraging patterns on a mixed substrate intertidal. In particular they vary in their relative utilization of substrate type and their preferences for the water's edge. Their foraging patterns change as the tidal cycle changes in ways which reflect the distribution of habitat and food. Other patterns, however, suggest the importance of competitive interactions among the different species.

## MARBLED MURRELET FEEDING BEHAVIOUR AND ECOLOGY

Carter, Harry R., and Spencer G. Sealy, Department of Zoology, University of Manitoba, Winnipeg, Manitoba R3T 2N2.

Summer distribution and abundance of Marbled Murrelets (Brachyramphus marmoratus) were examined, 1979 and 1980, in Barkley Sound, British Columbia. During the nesting period, a clumped dispersion of murrelets occurred in the SW end of Trevor Channel. Preliminary results of boat transects will be discussed and related to the oceanographic and food features of this location. Possible predictive feeding/breeding strategies may exist.

## RHINOCEROS AUKLET DIET, POSSIBLE INDICATOR OF DISTRIBUTION AND ABUNDANCE OF JUVENILE FISHES

Vermeer, Kees, Canadian Wildlife Service, P. O. Box 340, Delta, British Columbia V4K 3Y3.

The diet of young Rhinoceros Auklets (Cerorhinca monocerata) was investigated on Triangle Island in 1976, 1977, and 1978 and on Pine Island in 1977 and 1978. Rhinoceros Auklet prey varied between islands. Principal prey at Triangle Island were sandlance (Ammodytes hexapterus), rockfishes (Sebastes sp.) and Pacific sauries (Cololabis saira), while sandlance, herring (Clupea harengus pallasi) and rockfishes predominated at Pine Island. Bluethroat argentines (Nansenia candida) were a principal prey only at Triangle Island, in 1978. Prey varied annually as well as seasonally. Major annual variations were the early and predominant appearance of sauries combined with a scarcity of sandlance and rockfishes in 1976; the annual fluctuation in abundance of year classes of sandlance and herring; a drastic annual change in rockfish species; and the appearance of bathypelagic bluethroat argentines in 1978. Seasonal variations were the predominance of sandlance and rockfishes in July and the greater importance of Pacific sauries in August. Prey size and numbers also varied. Possible reasons for all those variations and the use of the Rhinoceros Auklet as a practical indicator of changes in distribution and abundances of juvenile coastal fishes in British Columbia are discussed.

## RESOURCE PARTITIONING BETWEEN FIVE HAWAIIAN PELICANIFORMS

Harrison, Craig S., U.S. Fish and Wildlife Service, P. O. Box 50167, Honolulu, Hawaii 96850.

Hida, Thomas S., Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, Honolulu, Hawaii 96812.

Two hundred food samples from Masked Boobies, Red-footed Boobies, Brown Boobies, Red-tailed Tropicbirds, and Great Frigatebirds were collected in the Northwestern Hawaiian Islands and analyzed in the laboratory using standard techniques. Preliminary results indicate that all species rely to some extent on flying fish (Cypselurus sp., Exocoetus volitans), ommastrephid squids (Symplectoteuthis sp., Ommastrephes sp., Hyaloteuthis sp.), and jacks (Decapterus sp.). Additionally, some species rely on anchovies (Stolephorus buccaneeri), sun fish (Ranzania laevis), tunas (Katsuwonus pelamis), goat fish (Mullidae), and dolphin fish (Coryphaena sp.). Differences in proportions of diet components and prey size were apparent. Hawaiian pelicaniforms feed opportunistically on shoaling fish and squid and are therefore good indicators of available surface fauna. It is argued that Hawaiian pelicaniforms have evolved northern spring-summer breeding seasons to take advantage of seasonally occurring flying fish, squid, and other prey species.

## ETHOLOGY OF THE DEFENSIVE BEHAVIORS IN FIVE CORMORANTS

Siegel-Causey, Douglas, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721.

I analyzed the defense behaviors of five cormorants (Phalacrocorax auritus, P. pelagicus, P. urile, P. penicillatus, and P. olivaceus) using multiway contingency tables. This allowed me to describe the complex behavior sequences by high-order Markov models. In all species, behavior triads and quartads were more frequently employed in defense of the nest than the dyads identified by conventional analysis: a situation previously suggested by Schreiber for the Brown Pelican (Pelecanus occidentalis). I tested these models for similarity between species, and found that three groups can be derived: 1) P. auritus and P. olivaceus; 2) P. pelagicus and P. urile; and 3) P. penicillatus. These groups support G. F. van Tets' reorganization of the Phalacrocoracidae into two genera and five subgenera.

## PRELIMINARY REPORT ON THE BEHAVIORAL PATTERNS OF THE HEERMANN'S GULL (Larus heermanni) DURING THE BREEDING SEASON.

Velarde, Enriqueta, Instituto de Biología, U.N.A.M., Apartado Postal 70-153, México 20, D.F.

During two breeding seasons 700 hours of observations have been made on the behavioral patterns of the Heermann's gulls breeding in the Marine Migratory Bird Sanctuary of Isla Rasa, Baja California, Mexico, where the breeding population is approximately 600,000 individuals. An average of 5 hours of observation per day were made between 5 and 23 hours. From these observations the basic behavioral repertoire, including displays and calls, has been obtained. These displays and calls are described and discussed regarding their form, context and function, and are compared in form and context with those found in other species of the same genus.

CONTROLLED ENVIRONMENT PROPAGATION OF SPHENISCIDS WITH EMPHASIS ON THE HIGH ANTARCTIC SPECIES

Todd, Frank S., Hubbs-Sea World Research Institute, San Diego, California 92109.

Information is presented on the maintenance, husbandry and propagation of high Antarctic, Subantarctic and tropical penguins within a controlled environment. Notable reproductive success has been achieved with Adelie penguins and to some extent, with Humboldt penguins. Since December of 1977, 112 Adelie penguins have fledged, 56 of these during the 1979/80 season alone. Eggs have also been laid by Emperor, King, Rockhopper, and Macaroni penguins. The techniques utilized to promote propagation as well as methods developed for hand-rearing spheniscid chicks are discussed. Much information has been collected, tabulated, and analyzed. The results provide meaningful baseline information with regard to pair-bond duration, nest-site fidelity, incubation temperatures, growth rates, etc.

THE UTILITY OF TIME-LAPSE PHOTOGRAPHY IN AVIAN RESEARCH

Keith, James O., U.S. Fish and Wildlife Service, Denver, Colorado 80225.

Presentation will consist of examples of time-lapse photography obtained in studies of brown pelican reproduction. The film and narration will define the utility and limitations of time-lapse photography as a research tool. Features of cameras and projectors will be discussed.

TRENDS IN LEVELS OF ORGANOCHLORINES IN GREAT LAKES HERRING GULLS

Mineau, Pierre, D. Vaughn Weseloh, D. J. Hallett, Canadian Wildlife Service, C.C.I.W., P. O. Box 5050, Burlington, Ontario L7R 4A6.

Since 1974, egg levels of major organchlorines have been systematically monitored in two herring gull colonies on each of the Canadian Great Lakes. Generally decreasing levels of DDE, DDT, dieldrin, HCB, mirex, and PCB's (1254/1260) were regressed over time on a log-normal model. Since a good fit ($P<.05$) indicative of first-order kinetics was obtained in most cases, half years and projected years of non-detection were computed for each data set. DDT, as expected from its labile nature, had the shortest half-life ranging from 1.4 to 2.2 years depending on the colony. Mirex, interestingly, had a half-life of 2.4 and 2.7 years on Lake Ontario but 4.5 years in the vicinity of the Niagara River, suggesting a continued availability of the banned chemical. The highest half-life was that of PCB's in western Lake Erie which is not surprising in view of the very high levels registered in the Detroit River. Systematic declines were harder to establish in eggs of Lake Superior birds. Possible reasons will be discussed. These and other observations will be considered in light of the continent-wide organochlorine situation.

RED FOX PREDATION OF SEABIRDS AT SHAIAK ISLAND, ALASKA

Petersen, Margaret R., U.S. Fish and Wildlife Service, Marine Bird Study Group, Division of Research, 1011 E. Tudor Road, Anchorage, Alaska 99503.

Two red foxes (Vulpes fulva) invaded Shaiak Island before the 1976 nesting season, and their impact on the nesting success of seven species of seabirds was determined. Common Eider (Somateria mollissima), Glaucous-winged Gull (Larus glaucescens), and Common Murre (Uria aalge), which nest in areas accessible to foxes, did not raise any young to fledging. Double-crested Cormorant (Phalacrocorax auritus) were only slightly more successful - 13 of 300 (4.3%) of the pairs raised one or more young to fledging. Twenty-one of 59 (35.6%)of Tufted Puffin (Lunda cirrhata) pairs lost eggs or chicks to foxes and foxes may have killed 6,600 of 79,200 (8.3%) of the adult puffins on the island. Black-legged Kittiwake (Rissa tridactyla) and Pelagic Cormorant (Phalacrocorax pelagicus), which nest on cliffs inaccessible to foxes, lost 150 of 10,000 (1.5%) and no nests, respectively, to foxes. There was no change in nest site selections by seabirds in the year following disturbance by foxes. Any change in the distribution of individual species nesting in areas vulnerable to fox predation would be discernible only over years of continuous nest predation by foxes.

## SPECIES INTERACTIONS AND COMMUNITY STRUCTURE IN ALASKAN SEABIRD COLONIES

Whittam, Thomas S., and Douglas Siegel-Causey, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721.

Previous studies of colonial seabirds suggest that similarities among geographically distinct seabird communities, in terms of ecologically-matched species, are strong evidence for structure in these bird assemblages. We quantify species associations and community structure within five nesting guilds of Alaska seabirds using multiway contingency tables and log-linear models. The observed species combinations differ in frequency from those expected using an independent assortment model. Simple models that adequately describe the data structure contain mostly two-way interactions between species. Higher-order interactions, although uncommon, may suggest a type of diffuse competition. A ranked measure of resource overlap is uncorrelated with the magnitude of species interactions within guilds, but is positively correlated with deviations from independence among all species pairs.

## SIBLICIDE, THE MECHANISM OF BROOD REDUCTION IN BLACK-LEGGED KITTIWAKES

Braun, Barbara M., Department of Ecology and Evolutionary Biology, University of California, Irvine, California 92717.

Brood reduction is operating in the population of Black-legged Kittiwakes breeding on St. Paul Island, Alaska. Baseline breeding information reveals that the young of a brood are predisposed, at egg-laying, to be of graded competitive ability. Both asynchronous initiation of egg incubation and differential egg weight and size contribute. As a result, the most competitive chick dominates in all broods with more than one young. Chick growth measurements and sibling and parent-offspring behavior in nests in which siblicide did and did not occur support the hypothesis that siblicide occurs as a response to food limitation at hatching. Chick feeding rates and the high occurrence of siblicide following periods of adverse weather indicate that nestling food delivery is not only influenced by that season's food levels, but also by parental behavior and the stress weather conditions impose during that season.

REPRODUCTIVE FAILURE AMONG ARCTIC SEABIRDS ASSOCIATED WITH UNUSUAL ICE CONDITIONS IN LANCASTER SOUND 1978

Nettleship, David N., Timothy R. Birkhead, and Anthony J. Gaston, Canadian Wildlife Service, Bedford Institute of Oceanography, P. O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2.

A comparison of breeding performance of populations of seabirds in Lancaster Sound and vicinity shows that 1978 was a disaster year. Breeding rates for surface-feeding species (Northern Fulmar, Black-legged Kittiwake, Glaucous Gull) were reduced to 10-20% while pursuit-diving species (Thick-billed Murre, Black Guillemot) which did manage to reproduce close to a normal level did so late and as a consequence suffered a very high pre- and post-fledging mortality. A detailed examination of Thick-billed Murres revealed a three-week delay in egg-laying, the production of smaller eggs and chicks, reduced chick-feeding rates and abnormal parental behaviours. These data represent the first detailed account of the effect of unusually severe ice conditions on reproduction of arctic seabirds.

IMPROVED QUALITY OF LIFE PARAMETERS OF DOUBLE-CRESTED CORMORANTS IN CANADIAN WATERS OF THE GREAT LAKES

Weseloh, D. Vaughn, Pierre Mineau, and Stanley M. Teeple, Canadian Wildlife Service, C.C.I.W., P. O. Box 5050, Burlington, Ontario L7R 4A6; Gerald B. McKeating, Canadian Wildlife Service, London, Ontario N6E 1Z7; and S. Postupalsky, Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin 53706.

During the period 1972/73 to 1980, the number of active colonies of Double-crested Cormorants in the Canadian waters of the Great Lakes increased by approximately 50%. During this same time the breeding population recovered from a low of approximately 170 pairs to over 600 pairs. Productivity also increased from an average of 0.2-0.3 young/nest (1972) to 1.71-2.15 young/nest (1980). Concomitantly, eggshell thinning has decreased from a range of 9-30% (of pre-1947 levels) in the early 1970's to 6-14% in 1979. As in other recovering cormorant populations (e.g., Anacapa Island, California) egg residues of DDE have decreased (on two of three colonies sampled). Those of PCB's, other organochlorines, and mercury show more variability.

SUMMER DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS ON ISLANDS SOUTH OF THE ALASKA PENINSULA BETWEEN JUTE AND AMBER BAYS

Bailey, Edgar P., U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99503.

A reconnaissance of islands in the eastern Alaska Peninsula region of the recently established Alaska Maritime National Wildlife Refuge was conducted in June and July 1980. Excluding nocturnal nesters and Kittlitz's and Marbled Murrelets, less than 50,000 pairs of seabirds representing 19 species were estimated on the approximately 400-km survey involving 100 islands. Ninety percent of the region's seabirds nest on just six islands, and nocturnal nesters were found on only four islands. Greatest seabird numbers and diversity exist on Ugaiushak, where extensive previous research has occurred. Fork-tailed Storm-Petrels are most abundant on Central Island, which like

Ugaiushak has small populations of Leach's Petrels and Ancient Murrelets. A small Rhinoceros Auklet colony was discovered on Hydra Island. Tufted Puffins, which breed on 15 islands, were the most common species and were twice as numerous as Horned Puffins. Black Oystercatchers were the most widely distributed species. Only three islands had kittiwake colonies, and murres nested on only two. Red-faced Cormorants were the most abundant of the three cormorant species present. No foxes remain on any islands. The limiting factor to seabird nesting off the eastern Alaska Peninsula is the brown bear.

## STATUS OF THE RING-BILLED GULL ON THE CANADIAN LOWER GREAT LAKES

Blokpoel, Hans, Canadian Wildlife Service, Ontario Region, 1725 Woodward Drive, Ottawa, Ontario K1A 0E7.

The nesting population of the Ring-billed Gull on the Canadian portion of the lower Great Lakes system (Lake Erie, Niagara River, Lake Ontario, upper St. Lawrence River) has rapidly increased in recent years. The largest increase was recorded at the man-made Eastern Headland, Toronto Outer Harbour, where a new colony grew from about 20 nests in 1973 to over 65,000 nests in 1980. Where historical data are available, changes in the size of the individual colonies are documented. Possible causes of the increase of the Ringbill population are reviewed and possible effects of that increase on human health, flight safety, and other bird species are discussed.

## INLAND ANCIENT MURRELETS: AN UPDATE

Sealy, Spencer G., and Harry R. Carter, Department of Zoology, University of Manitoba, Winnepeg, Manitoba R3T 2N2.

About 60 Ancient Murrelets have been recorded at various inland points in North America. Most records are from November to mid-December, with a second smaller peak in March. Examination of the available inland specimens in museum collections revealed a preponderance of young females. We discuss the timing of these island occurrences in light of the biology, winter movements, and winter distribution of Ancient Murrelets and speculate on how and why the mostly young females got there.

## DISTRIBUTION AND ABUNDANCE OF SEABIRDS WINTERING IN KODIAK ISLAND WATERS

Forsell, Douglas J., and Patrick J. Gould, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99503.

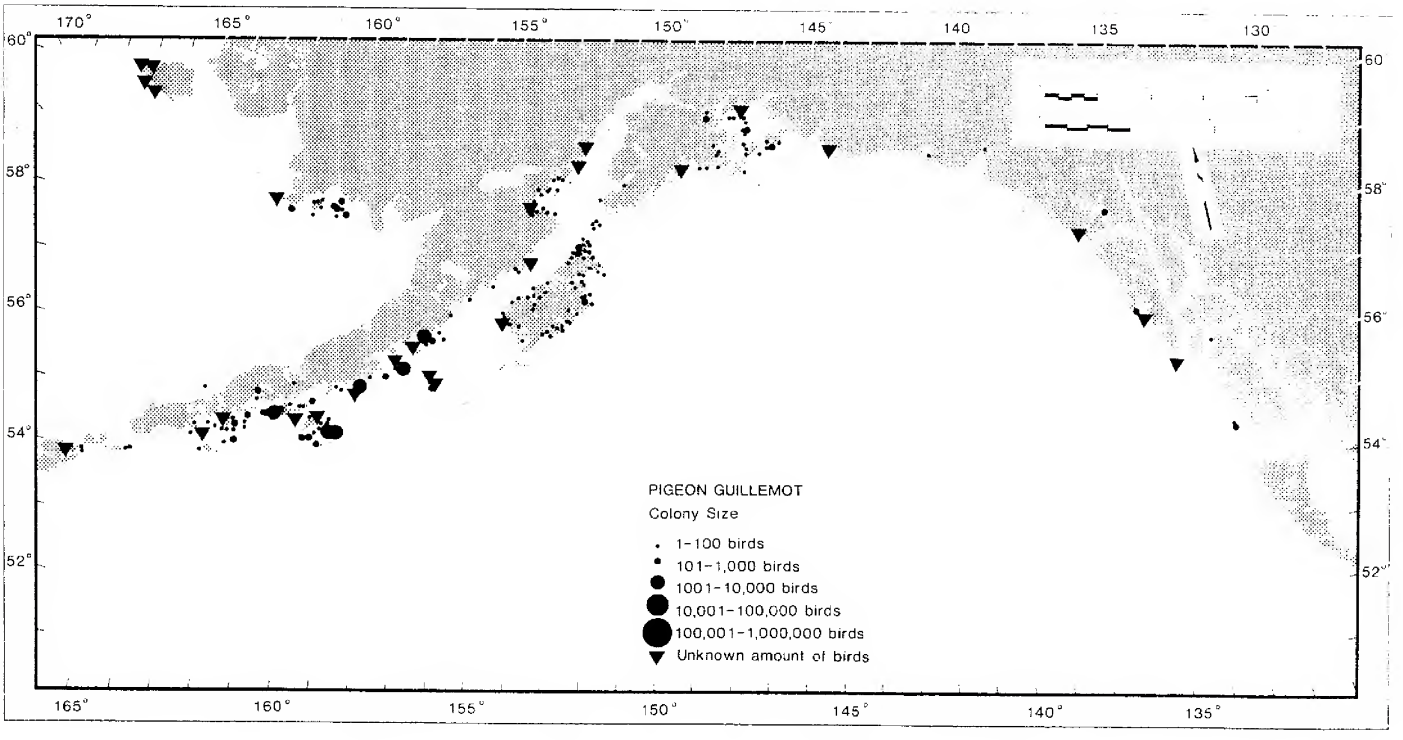
Forty-four species of seabirds were observed during the winter of 1979-1980 in the Kodiak Archipelago. The species composition of seabirds in the area shifted considerably from summer to winter. Density indices derived for bays in November and February of about 84 and 155 birds/km$^2$, respectively, were well above the 50-60 birds/km$^2$ obtained by the same methods, but over a more limited area, during the summer of 1977. Seabirds over the continental shelf on the other hand showed a decrease in abundance with the overall density index dropping from 62 birds/km$^2$ in June 1977 to 23 birds/km$^2$ in February 1980. Density indices for shelfbreak and oceanic habitats showed a small increase from about 4 birds/km$^2$ in June 1977 to 7-8 birds/km$^2$ in February 1980. Prime habitats for seabirds wintering in the Kodiak area include ice-

free estuaries for puddle ducks; marine waters less than 25 m deep with rock or boulder substrates for seaducks; and waters near the 100 m isobath in mid-bay areas for murres. Common Murres were the most abundant wintering seabird in the area. The Kodiak Archipelago probably represents a major nursery and wintering area for this species. We estimate that the number of seabirds wintering over waters surrounding Kodiak Island is over 1,500,000, a value somewhat below the 2,200,000 estimated to occupy these waters in summer.

## OLFACTORY STRUCTURES IN THE NORTHERN FULMAR

Hutchison, Larry V., and Bernice M. Wenzel, Department of Physiology, UCLA School of Medicine, Los Angeles, California 90024.

In conjunction with our fieldwork on the olfactory behaviors of procellariiforms, we have begun anatomical and neurophysiological work in the laboratory on Fulmarus glacialis, one of the species studied at sea. In addition to their unique nasal architecture, members of Procellariiformes possess comparatively the largest olfactory conchae, olfactory mucosa, and olfactory bulbs among all avian forms examined. Our work to date suggests that the central olfactory connections, at least in F. glacialis, are also proportionately more extensive than in species with smaller olfactory systems, such as the pigeon. Spontaneous neural activity recorded from cells in the olfactory bulb is altered in characteristic ways by electrical stimulation of olfactory nerve twigs. Activity is similarly affected in other forebrain sites known to receive projections from the olfactory bulb in the pigeon. Using the same food-related odors (fish oil and krill homogenate) that attract fulmars at sea, spontaneous firing of olfactory bulb cells was consistently inhibited. Baseline firing rates were unaffected by control substances.



ATTENDANCE

United States:

Alaska: Edgar Bailey, Doug Forsell, Patrick Gould, David Nysewander, Margaret Petersen, Gerald Sanger

Arizona: Miriam Axelrod, William Howe, Jay Nelson

California: Bernadette Allen, Lee Astheimer, Bob Boekelheide, Barbara Braun, Elizabeth Flint, Judith Hand, Harriet Huber, Larry Hutchinson, Harry Ohlendorf, Ralph Schreiber, Art Sowls, Frank Todd, Bernice Wenzel

Colorado: James Keith, Joseph Strauch, Jr.

Hawaii: Craig Harrison, Audrey Newman, Robert Shallenberger

North Dakota: Craig Faanes

Oregon: Melody Roelke, Palmer Sekora, Mark Strong

Washington: Lora L. Leschner, Terence R. Wahl

District of Columbia: Mark Shaffer

Canada:

British Columbia: Ian Robertson, Anne Vallee, Kees Vermeer

Manitoba: Harry Carter, Spencer Sealy

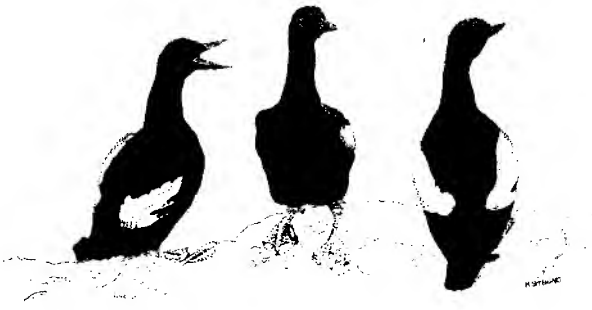
Nova Scotia: David Nettleship

Ontario: Hans Blokpoel, Pierre Mineau, Chip Weseloh

Mexico:

Distrito Federal: Enriqueta Velarde

Unknown: Tom Steerhoff



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Bartonek, J. C. & Nettleship, D. N. 1979. Conservation of marine birds of northern North America. Wild. Rep. 11. Pp. ix + 319. Washington, D.C.: U.S. Dep. Inter., Fish. & Wildl. Serv.

Long ago and far away, in the beautiful spring of 1975 just before the Limits to Growth caught up with us, a group of seabirdmen were suddenly invited to Seattle to consider a series of contributions dealing with Alaska, western North America, and anywhere else the organizers could think of. Behind the scenes there was a private carve-up of some tens of millions of dollars allocated for emergency studies of the outer continental shelf of Alaska before the start of offshore oil development. For a long time it was uncertain whether the Proceedings, for which we had been instructed to provide photo-ready copy, something which quite defeated the British contributors, would ever appear, and letters enquiring whether our contributions were really wanted received no answer. Presumably out of shame, the Fish and Wildlife Service has finally published the 23 contributions (55% of those commissioned) with which it was eventually confronted, though the discussion was considered fit only for private circulation (non-participants may care to consider whether they wish to secure a copy under the Freedom of Information Act). The whole provides a massive, or possibly I should say heavy, contribution which no serious student of seabirds can afford to ignore.

The symposium opens with a short paper on "Long-term climatic and oceanographic cycles" by Myres (pp. 3-7) claiming there is lots of background information available though he doesn't have space to list it, and he expects that it applies to birds as well. The discriminating reader will skip this and start with an excellent original contribution dealing with sea-ice by Divoky (9-17), which might have made a better opening. This is followed by a series of sound systematic regional accounts dealing with the birds of the Chukchi and Bering Seas, where they are numbered in millions, by Bartonek & Sealy (21-31), the Aleutians, where they are innumerable or at least unnumbered, by Sekora, Byrd & Gibson (33-46), tailing off through the northwest Gulf of Alaska by Sowl (47-71), south to Washington by Manuwal & Campbell (73-91). Here they are only numbered in hundreds of thousands, though the scene offshore is still enough to turn European ornithologists green with envy.

The frankly woolly literature on seabird foods and trophic relationships is then reviewed by Ainley & Sanger (95-122), Drury provides a useful sermon on population dynamics (123-139), Dunn another on time-energy use and life history strategies (141-166), and there is a perfunctory summary of zoogeographical considerations by Udvardy (167-170). The conservation section starts with short assessments of social and economic values of marine birds by Cline, Wentworth & Barry (173-182), and the potential impact of resource development by McKnight & Knoder (183-194). This is followed by an important paper, for which we have been waiting, on Mortality to marine birds through commercial fishing by King, Brown & Sanger (195-199), reviewing the subject and estimating the annual mortality of birds in the Japanese gill-net fishery at about half a million, or 4.7 million since 1952, much the same number as in the North Atlantic. The latter area has many fewer birds, so that the relative impact may be less severe in the Pacific.

We are now getting to the heart of the volume. Straty & Haight next consider interactions between seabird and commercial fish stocks (201-219), and Jones & Byrd the interactions between the birds and the numerous mammals,

and also blackflies (Simuliidae), introduced to their breeding islands (221 226). The second paper covers what is probably the worst impact by man on Alaskan seabirds so far, the introduction of predators to offshore colonies by fur-farmers: "by 1936, the Aleutian archipelago constituted a large scale fox-farm, which in its 23 years of existence as a refuge had produced 25,641 fox pelts with a value of $1,162,826. During the same period arctic foxes were introduced on almost every island from the Aleutians to Prince William Sound, and on some islands in southeastern Alaska . . . [in] 2,501 fox droppings . . . from 22 of the Aleutian Islands . . . 57.8% of the food items . . .was avian--48.9% seabirds . . . the most obvious damage has been the nearly complete extermination of the Aleutian Canada Goose Branta canadensis leucopareia." It remains to be seen whether in time interactions with commercial fisheries will have a greater impact; personally I doubt whether the oil industry can compete with either.

King & Sanger (227-239) then try to deduce from first principles, in ways inadequately explained, how sensitive all the birds are to oil developments while ignoring all the voluminous literature describing actual observations. I am sorry to be rude about a gallant attempt, but personally I fear that a classification which selects the Pigeon Guillemot Cepphus columba and Whiskered Auklet Aethia pygmaea as the most vulnerable species, and the Canada Goose, Least Sandpiper Calidris minutilla, Arctic Tern Sterna paradisaea and Raven Corvus corax as the least vulnerable, (or can it be the other way around?) is hopelessly unreal.

The reviews of "Programs and authorities related to marine bird conservation" in Washington State by Larson (243-246) and British Columbia by Munro & Campbell (247-250) are of mainly local administrative interest. The authors dealing with the important areas to the north are conspicuous among those who did not deliver their manuscripts, and I hope this does not mean that they have no programmes but rather that they were usefully occupied with them. Hay then reviews "The petroleum industry's role in marine bird conservation" (251-258), or rather what other people have done and the American Petroleum Institute might do about oiled birds. The general contributions end with three important reviews of work with seabirds elsewhere, on their conservation in New Zealand by Williams (261-266) and in the Danish Monarchy (otherwise known as Denmark, the Faroes and Greenland) by Salomonsen (267-287), and summarizing their numbers in Norway by Einar Brun (305-315). The last contribution is of outstanding importance because the author was tragically killed in the course of an aerial survey the following year and there seems to be no other general account of his results. The whole volume is dedicated to Brun and also to R. D. Bergman, K. A. Boughton and J. L. Haddock, lost during an aerial survey of the Gulf of Alaska the year before, a reminder of the price we pay for real data.

There is a summary at the end by I. C. T. Nisbet (305-315) which has already been widely circulated and admired. It starts off rather oddly by saying he proposes to discuss the things which have not been considered already. He then confesses that he knows even less about the area than everybody else, and lists a number of things we do and don't know. We know that there are about a hundred million seabirds in the area--"I do not think it is an exaggeration to say this is one of the great neglected biological resources of the world". He considers that their abundance, diversity, the wide range of some outside the area in question, and the unique character of the local forms have been inadequately emphasized. He thinks more general surveys and local studies in more detail are required, with more information about demography, winter distribution and the use of patchy resources.

He considers that the first priority in conservation is to prevent the occurrence of accidents with oil, most of which can be eliminated with the exercise of sufficient care. Secondly the breeding colonies require protection and management on a long-term basis: this should include the control of predators. There is also a need for more education of the public, which must include showing them the birds. The only real justification for bird conservation lies in persuading the public that they want them, at which point it is found to be surprisingly cheap. It could easily be covered by the imposition of a Conservation Tax of a few cents a barrel on oil as it is produced. He provides a list of detailed recommendations.

I suppose it is a fair summary, though I fear I have a good many doubts about what was said. I suggest we are developing delusions of grandeur if we try and describe any birds except poultry as "one of the great biological resources of the world". This expresses well one of the failings of the conference--a preference for wild statements over substantiated facts, which I suppose is not unnatural to people who suddenly discover tens of millions of dollars in the kitty. After considerable experience of the development of a more advanced oil-producing economy I have personally also lost most of my fear of its impact on natural ecosystems but gained an increased respect for the influence of natural phenomena, and some other activities of man and the animals that he introduces to islands, which by and large they are less able to withstand. Oil production is a very specialized human activity, and if we show sufficient determination we can control it. It is less easy to control other more natural forces including the behaviour of man himself.

There is one aspect of this volume that particularly worries me. The conference was only the overture to a great enterprise, The Alaskan Outer Continental Shelf Environmental Assessment Program. For a few years there was a great deal of activity and numerous ornithologists were able to commandeer ships, aircraft and computers almost at will. Then as usual it fell victim to an economy drive, leaving a mass of unpublished results. If it has taken so long to produce this Proceedings, which contains only half the preliminary material it should and little actual data, what is to be the fate of the real results? The history of American marine ornithology is littered with great enterprises which failed to realize their full potential--the United States Exploring (Wilkes) Expedition in the late century, the Blossom and Whitney South Sea Expeditions in the 1920s, the Pacific Program in 1960s. Is this another?

W. R. P. Bourne

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# OIL POLLUTION OF THE SEA

## Developments since 1975

By Dr. Viktor Sebek LLB, LLM
Secretary, British Advisory Committee on Oil Pollution of the Sea.

Control of marine pollution by hydrocarbons has continued to play a most important role in the development of international environmental law throughout the 1970s. However, the promises which Governments made to their electorates within the auspices of the Inter-Governmental Maritime Consultative Organisation (IMCO), the North Atlantic Treaty Organisation (NATO) and the Stockholm Conference on the Human Environment, namely, that intentional discharges of oil will be eliminated no later than the end of the present decade, remain unfulfilled. Perhaps the original resolution was much too ambitious, but the most recent reports continue to indicate that the overall situation is not improving, and may in fact be deteriorating.

In addition to the sheer complexity of the problem, the lack of decisive action is due to some important developments in international relations. Oil has now become black gold in the true sense of the word. Until the current pattern of energy use is changed drastically, most developed and developing countries will continue to rely heavily on hydrocarbons. Those countries lucky enough to possess large onshore and offshore reserves have started using the oil as an economic and political weapon. Economic repercussions of the huge price increases were considerable--not least in the shipping world which has still not recovered from the slump on the tanker market--but so were the political ones. The pattern of maritime transport of oil (which has traditionally attracted the greatest attention in debates on pollution although it is quantitatively less important than the land-based discharges), is changing rapidly. The traditional maritime States, such as Britain, have been selling their fleet and in relative terms lost a considerable percentage of world tonnage. On the other hand, the tonnage of the flags of convenience, and some third world countries, has been increasing. At the beginning of 1979, for example, several Hong Kong owners possessed a larger fleet than that of Britain.

As many of the tankers which the developing countries have been buying are more than 10 years old, it remains to be seen how this will affect the trend of accidental pollution in the 1980s. Many observers argue that older vessels are more prone to accidents even when properly maintained; they become an even more likely source of pollution when adequate systems of crew training, technical expertise and management are not available.

Governments have continued to cooperate closely in regulating marine pollution, but have generally tended to marshall their resources to deal with problems of a particular accident which aroused public opinion. And the pressure to act lessened whenever a new oil shortage hit the country concerned. This trend can be expected to continue, especially after the events in Iran in 1979, when oil production was cut down substantially.

Pollution from vessels continued to attract more attention than any other source of pollution, especially at IMCO. This body, which is one of the few United Nations agencies so far immune from political infighting, whether at the East/West or North/South level, has adopted a number of important new conventions. At the diplomatic conference on Tanker Safety and Pollution Prevention (TSPP) which was held in London in February 1978, two important legal instruments were adopted: the Protocol Relating to the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and the Protocol Relating to the International Convention for the Safety of Life at Sea (SOLAS 1974). The main virtue of these protocols is that they recognized the slow process of development of international law and attempted to overcome this problem in an imaginative manner: they effectively amend the two conventions which are still not in force. Moreover, these conventions apply only to new ships although it is clear that the existing fleet will continue to carry the bulk of the world's maritime trade in oil for many years to come, and will thus present a most serious risk of pollution. The two protocols have therefore imposed certain obligations on the existing fleet, and tightened up regulations applicable to new tankers. The most important features of the protocols include rules on segregated ballast tanks (SBTs) for new crude tankers of 20,000 tons and above; SBTs for product carriers of 30,000 tons and above; protective location of SBTs in new tankers; improved drainage and discharge systems for new and existing ships; inert gas systems to be fitted on all existing and new tankers of 20,000 tons and above; improved steering gear, radar and collision avoidance aids; tightening up of inspection and certification and introduction of crude oil washing system (COW) on new tankers.

However, these rules will prove valuable only if the two protocols (and the conventions which they were designed to improve) are ratified. And the state practice in this field is not encouraging. For example, the 1969 Amendments to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil, did not enter into force until January 1978--nine years after they were adopted! ! ! We have got used to this situation in international law, but one could well imagine the chaos which would exist in internal legal systems if new measures could not be enforced until after such a long period of time. The same chaos of course, exists at the international level, except that there is very little that one can do about it. It is therefore not surprising that the threat of unilateral action on the part of important maritime states often serves as a powerful impetus to the remainder of the international community to act. For example, the 1978 IMCO Conference was convened only because President Carter stated in his speech of 17 March 1977 that the United States would find it necessary to introduce a series of stringent measures--also to be applied to foreign tankers using American ports--if IMCO did not tighten up the existing international rules. At the same time, the strong environmental pressure in the United States was a direct result of a series of pollution accidents which occurred in the mid 1970s, especially the Argo Merchant incident in 1976. Similar pressures were felt in France after the Amoco Cadiz ran aground on 17 March 1978 off the coast of Brittany which was previously polluted by oil from Böhlen and Olympic Bravery, and also in the United Kingdom where the English, Welsh and Shetland coasts were heavily polluted in 1978 by oil from the Eleni V, Christos Bitas and Esso Bernicia.

The southern tip of Africa had its own share of pollution following the collision between the Venpet and the Venoil, in addition to chronic pollution on the beaches of West Africa which became worse while the Suez Canal remained closed. The Caribbean suffered following the collision between the Aegian Captain and the Atlantic Empress, in July 1979; this accident also resulted in a loss of many lives. A similar large toll in human life occurred in Ireland when the French tanker Betelgeuse exploded in Bantry Bay on 8 January 1979; fifty persons were killed, making it the biggest industrial accident ever to take place in Ireland. Oil pollution was not serious initially as most of the oil burned in the ensuing fire, but the sunken portions of the tanker continued to seep during most of 1979, and this chronic pollution will undoubtedly cause environmental damage.

Although IMCO remains the principal organization which regulates marine pollution at the global level, most of its conventions are technical. Jurisdictional issues remained the province of another United Nations forum: the Third UN Conference on the Law of the Sea (UNCLOS III), whose early developments were discussed in Bulletin XII (pp. 256-257). The Conference has not yet adopted a comprehensive convention, the main problem it faces being the multiplicity of issues which are highly controversial economically, of the marine environment, but also with the legal regime of the deep sea-bed (beyond the limits of national jurisdiction), limits and delimitation of the continental shelf, economic zone, territorial sea, islands (including artificial structures), transfer of technology and many other issues. Although certain problems have been overcome a "gentleman's agreement" was reached that any convention must await consensus on the entire package deal. However, consensus on some issues has been reached and has started developing into the emerging customary law. Most coastal states have thus now adopted a 200 mile exclusive fishing zone, although no existing international convention allows such practice. In some countries a strong pressure also exists for coastal states to incorporate in their national legislation certain progressive norms on environmental protection which are no longer seriously contested at the Conference.

Nevertheless, jurisdiction remains the central issue. For, however good the technical rules of IMCO conventions may be, they remain inapplicable as long as the flag state has the primary responsibility over its ships. Reports which a number of maritime states, such as Britain, France, Japan and Australia have submitted to IMCO suggest that flag states seldom institute legal proceedings against their ships which commit offences in foreign waters. The shipping industry, which was for many years a strong opponent of the principle of port state jurisdiction, would preferto see some tightening of inspection procedures rather than witness an increase in legal proceedings, particularly if this should result in detention of vessels or their masters.

It is widely recognized that human error (however this may be defined) is the main cause of shipping accidents. In spite of this, the manning of ships was not an area with which the international law-making fora concerned themselves. However, in July 1978, IMCO convened a conference which adopted the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers. The Convention, which is not yet in force, lays down minimum requirements for the certification of masters, chief engineers, mates, radio officers, and other members of the crew. There are also requirements to maintain and update the necessary knowledge. This is particularly necessary

on highly complex new ships, and on ships carrying dangerous cargoes, especially liquid natural gas (LNG). Following the grounding of the LNG carrier El Paso Paul Kayser at La Perla in June 1979, the insurers confirmed that an explosion could have easily blown up half of Gibraltar!

Unfortunately, the provisions of the 1978 Convention will take some time to implement. It is difficult for a shipowner to find any crew at present, let alone good crew. A strong pressure therefore exists in some maritime countries that restrictions on the percentage of foreign crews allowed on national vessels should be relaxed.

As shipping is an international activity, most international conventions are adopted at IMCO, whose membership now exceeds 100 states. However, certain seas are more vulnerable to pollution than others, partly because of their geographical features (e.g., the semi-enclosed seas) and partly because of the pattern of tanker and other traffic. UNCLOS III, and also IMCO, have therefore recognized the status of the "special areas" where standards more stringent than those which are stipulated in the relevant universal convention, might be necessary. The United Nations Environment Programme (UNEP) which is based in Nairobi, took charge of planning the regional seas programme and as a result of its work, two areas are already covered by regional conventions. In 1976, a Convention for the Protection of the Mediterranean Sea against Pollution, and two related protocols (on dumping and on cooperation in combating pollution were adopted in Barcelona. In April 1978, a Convention for Cooperation in the Protection of the Marine Environment from Pollution was adopted in Kuwait for the Arabian/Persian Gulf area.

Work is also in progress towards adopting regional conventions for the Red Sea, the Gulf of Guinea, the Caribbean (where the major threat is from pesticides and industrial waste rather than oil), the East Asian Seas (which have been divided for regulatory purposes into the Bay of Bengal, the Gulf of Thailand, the South China Seas, the Sea of Japan/Yellow Sea/East China Sea area and the seas of the Eastern Archipelago which include the Celebes, Java, Sulu, Timor and Arafura seas. However, the first region to be tackled will be the waters of the Straits of Malacca, which is one of the busiest straits in the world, and where a number of serious accidents have already occurred.

The Baltic States have already adopted a convention on the Protection of the Marine Environment of the Baltic Sea on 22 March 1974 (Helsinki Convention) which entered into force in October 1976.

In addition to UNEP, a number of other bodies, more regional in character, have also regulated or examined the problem of marine pollution. For example, the European Economic Community has been very active in this field. Some of its action was aimed at harmonizing discharge standards among member states (soon to include such important maritime countries as Greece, Spain and Portugal). This policy remained controversial, particularly in the United Kingdom where it was felt that standards ought to be based on the characteristics of the marine environment; some waters can obviously absorb a higher concentration of pollutants than others.

The Amoco Cadiz disaster generated a particularly strong political pressure for the Community to concern itself even more with protection of the marine environment. This move aroused some controversy as several member states were

reluctant to confer additional powers to the Community, partly for political, and partly for economic reasons. Even France, which now advocates a stringent environmental policy, "needed" the Amoco Cadiz disaster to realize that its interests as a coastal state, vulnerable to pollution, may prevail over the interests of its shipping industry.

The Organization for Economic Cooperation and Development (OECD) has also been active in the field of pollution, especially transfrontier pollution. In particular, a great deal of work was done on formulation of the now widely accepted "polluter pays" principle.

The question of compensation for pollution damage attracted considerable interest, especially since the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (the Fund Convention) entered into force in October 1978. Until recently, it was widely believed that the limits contained in the Fund Convention and the 1969 Civil Liability Convention (some $38 million) were sufficient to meet all necessary costs. However, the Amoco Cadiz case, currently pending in a Chicago court, has proved that the damage can exceed the currently available limits.

The Council of Europe is another inter-governmental agency which continued to deal with the marine environment. In addition, many non-governmental international agencies have passed resolutions, or simply acted as pressure groups. One should particularly mention the work of the International Union for the Conservation of Nature which passed a number of recommendations at the fourteenth meeting of its Assembly in Ashkhabad in 1978. Also active were local authority associations, such as the United Towns of the West European Coast, the International Union of Local Authorities and the Conference of European Peripheral Maritime Regions.

Land based pollution still received comparatively little attention. The only convention which deals with this problem is the (regional) Paris Convention of 4 June 1974 which is not yet in force.

Offshore generated pollution also remains largely unregulated at international level, perhaps because conditions in offshore fields vary widely from country to country and inspection is difficult. Some work on harmonization of appropriate rules has been carried out among the North West European countries since 1973. However, progress was achieved only in the field of compensation. In December 1976, those countries adopted a Convention and Exploitation of Seabed Mineral Resources. This convention is not yet in force.

The Ekofisk blow-out in 1977 did not serve as an incentive to Governments to act, perhaps because comparatively little damage was caused to wildlife. The Ixtoc I well blow-out in the Gulf of Mexico in the summer of 1979 may generate more interest in this problem. It is nevertheless curious how little attention the world press paid to this disaster until the oil began to affect the coast of the United States--in Texas.

It is difficult to predict whether the next few years will witness an overall improvement in marine pollution control. There are many factors which will influence the future developments:

(1) The primary responsibility rests with national Governments, and their reactions will depend on an unpredictable political climate. The previous practice has revealed that large scale pollution incidents influence public opinion which politicians cannot afford to ignore. On the other hand, oil shortages in the developed world also influence the reaction of the general public. One major problem here is that the responsibility for dealing with marine pollution is usually fragmented in many countries and the Ministry which represents the victims of pollution is not necessarily responsible for formulation of national policy in the same field.

(2) The shipping and oil industries also have an important role to play. They are aware that their public image depends partly on their environmental record, and are anxious to maintain high standards. The industry carries out a considerable amount of research and in some respects is well ahead of the work of the Government departments. However, statistics on safety record by flag and ownership do not necessarily indicate where the real responsibility lies. The general public is often unaware that many accidents involve ships on charter to reputable oil companies, whatever the flag they fly. Oil companies are now under considerable pressure to ensure that the ships which the charter conform with the same rules as those which they own themselves.

(3) The studies which GESAMP (the Joint Group of Experts on Scientific Aspects of Marine Pollution from IMCO/FAO/UNESCO/WHO/IAEA and UN) published on the effect of hydrocarbons on the marine environment suggest that research should be stepped up on many topics. The same applies to research in methods to clean up oil, tracking of oil slicks and identification of spills. Most discharges, especially deliberate discharges, do not result in prosecutions because it is not possible to identify the polluter. Research is now in progress in such countries as Finland, Sweden and the United States.

(4) Better monitoring of spills is also necessary in order to learn about the causes of spills and establish how serious the threat of pollution is in various parts of the world. The United States has developed a particularly sophisticated method of monitoring pollution off its own coasts, entitled the Pollution Incidents Reporting System. In Britain and Ireland, the Advisory Committee on Oil Pollution of the Sea carries out a comprehensive survey of oil pollution and is now studying the means to extend it to other countries of North Western Europe.

(5) A better knowledge of the sea-bed throughout the world is also necessary to improve the safety of shipping and reduce the risk of marine pollution. The problem which some countries encounter today is that hydrographic surveying was traditionally the responsibility of the Ministry of Defence whose budgets are frequently subjected to severe cuts. This issue was highlighted recently when the Soviet tanker Tsesis ran aground in the Stockholm archipelago on 26 October 1976 and polluted a large stretch of coast; the cause of the grounding was apparently a faulty chart, so that the Soviet owners have refused to pay for damages and actually asked the Swedish Government to reimburse them for the loss of the vessel!

As the seas have been declared the common heritage of mankind, it is hoped that those responsible for their management will keep their potentially limitless resources undiminished for future generations. To concentrate on the short term gains at a time when the science has revealed that the oceans can provide us with uses undreamt of only yesterday, would be unwise and inexcusable.

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Dear Colleague:

We are currently engaged in a research project to establish the magnitude of seabird mortality, and the factors responsible, in the Newfoundland region. As you may or may not be aware, there are several large seabird colonies in Newfoundland waters, including the largest breeding concentrations of Common Murre (Uria aalge) and Common Puffin (Fratercula arctica) in the Northwest Atlantic; as well as the second largest colony of Gannet (Morus bassanus) in North America. The development of large offshore oil deposits, hunting, and the commercial cod and salmon gill net fisheries pose real threats to the survival of these species, whose numbers have been declining in recent years. We are currently evaluating mortality from:

(1) drowning in cod and salmon gill nets. We estimate that tens of thousands of alcids die annually in the Newfoundland fishery. There is a direct correlation of alcid drowning with the presence of their main food source, capelin (Mallotus villosus). When capelin move inshore (June-July) to spawn, fishing activity (bird and human) intensifies and alcid net mortality rises dramatically and continues until the capelin leave the inshore fishing zones. We are extremely interested in all aspects of this interaction, e.g., capelin movement and behaviour, alcid feeding strategies and foraging patterns, oceanographic and meteorological influences, physical aspects of fishing gear, geographical and bathymetrical variations, energy flow through the system, intra- and interspecific competition, competition of man for fish resources, and age cohort structure of mortality.

(2) hunting. Newfoundland is the only province in Canada where hunting of murres is permitted, and it has been suggested that the hunter kill may be as high as 500,000 ± 50% per year. While this is a problem that only we in Canada can address specifically, there are aspects which are of universal significance, e.g., effects of weather, wind, tide, and sea-ice on murre availability in coastal areas, hunting techniques, cohort structure of mortality, etc. To date, hunting mortality has been analysed (by the Canadian Wildlife Service) using mail surveys with statistical evaluation of the returns. As the 50% confidence limits are rather large, we are interested in problems seen elsewhere in the world with regard to interpretation of survey returns, statistical analysis, biases and sources of error, questionnaire forms, and parts surveys, etc.

(3) oil. We are interested in two aspects of oil mortality:

(a) magnitude of oil mortality. We will be trying to establish oil mortality (and seasonal fluctuations) in one section of the Newfoundland offshore region with regular beach surveys and corpse drift experiments. Of

particular interest: interpretation of beach survey data, statistical analysis of corpse drift experiments, effects of currents and tide, weather, etc., flotation vs. sinking of oiled vs. non-oiled birds, differential susceptibility of seabird species, influence of weather on mortality (synergistic effects) and prevention and/or regulation strategies.

(b) oil toxicology. This is a broad topic and necessarily multidisciplinary in terms of research. There are a number of researchers at our university in the Biology, Biochemistry, and Chemistry Departments who would like to become involved in this field of research, especially in view of the oil development now taking place in Newfoundland. Since we are in a good position to obtain tissue and body specimens, we would like to encourage active research here. First, however, we need to sift through the literature and ascertain the crucial information required in terms of assessing mortality. To speed up this process we would appreciate input on research priorities and the techniques involved as well as evaluation of these data. Since we have the working material, we are interested in facilitating collaboration between researchers here and toxicology experts elsewhere.

(4) organochlorines and related products. Evidence to date suggests that PCB's, etc., have had little impact on seabird colonies in Newfoundland. However, insecticide and herbicide spraying is a growing practice here, and the recent discovery of PCB storage sites around the province prompts us to consider these pollutants as potentially serious threats. We would like to start gathering baseline information now, and the above comments on oil toxicology apply to our interests in organochlorines as well.

(5) natural mortality. Information on natural mortality is presently available from many sources, including our own research from previous years. We would, however, like to keep abreast of recent studies on population dynamics of seabirds, especially alcids. Of particular interest are observations of population fluctuations from factors other than those outlined above, e.g., changes in ocean currents, food availability, competitions, etc.

If any of the above topics are of particular interest or are, in fact, your area of research, we would appreciate receiving copies of any or all of your past publications and references to other important or significant publications. Suggestions and advice are welcomed, especially with regard to studying net mortality and feeding strategies, which are relatively obscure areas of study at the present time. If you know of others in your area who may be actively involved in similar research, please pass this on to them so that we may establish communication with them as well. Thank you for your cooperation; we look forward to hearing from you.

Yours truly,

William Threlfall
James Piatt

NEW PUBLICATIONS

The Editor welcomes notices, abstracts, and short reviews of publications on interest to seabird biologists. Especially desired are notices and sources of supply of publications of limited distribution which might not otherwise come to the attention of those who could use them.

Marine Birds

Burger, J., B. L. Olla, and H. E. Winn (eds.). 1980. Marine birds. Plenum. This book is volume 4 of the series Behavior of marine animals. The contents are:

Chapter 1. Seabirds as marine animals, R. G. B. Brown

Chapter 2. Chemoreception in Seabirds, B. M. Wenzel

Chapter 3. Habitat selection and marine birds, F. G. Buckley and P. A. Buckley

Chapter 4. Mate selection and mating systems in seabirds, G. L. Hunt, Jr.

Chapter 5. The influence of age on the breeding biology of colonial nesting seabirds, J. P. Ryder

Chapter 6. The communication behavior of gulls and other seabirds, C. G. Beer

Chapter 7. Mechanisms and adaptive value of reproduction synchrony in colonial seabirds, M. Gochfeld

Chapter 8. Development of behavior in seabirds: an ecological perspective, R. M. Evans

Chapter 9. Parental investments by seabirds at the breeding area with emphasis on Northern Gannets (Morus bassanus), W. A. Montevecchi and J. M. Porter

Chapter 10. The transition to independence and postfledging parental care in seabirds, J. Burger

Chapter 11. Comparative distribution and orientation in North American gulls, W. E. Southern

## Oil pollution

A reprint of the publication Marine oil pollution and birds is available for 2.50 pounds from the Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom.

## The true story

The unexpurgated version of "A study of the use of dredged material islands by colonial seabirds and wading birds in New Jersey" is still available from F. G. Buckley, Buckley Associates, 372 South St., Carlisle, MA 01741. Copies are available either for xeroxing (sic) or the cost to the author for xeroxing (sic).

## Abstracts of recent foreign literature by Ellen Chu and Mark Pierson

Barrat, A. 1974. [Note on the Grey Petrel Procellaria cinerea.] In Recherches écologiques et antarctiques françaises (Ecological and physiological research on the fauna of French southern and antarctic lands). Comité national français des recherches antarctiques (French National Committee on Antarctic Research), no. 33. (In French with English summary.)--Breeding on the Grey Petrel has been established for Crozet Archipelago. Measurements and breeding phenology are compared among various breeding sites. Growth of one chick is studied.

Barrat, A. 1974. [Note on the occasional visitors of Crozet Island.] In Ecological and physiological research on the fauna of French southern and antarctic lands. C.N.F.R.A. no. 33:25-7. (In French with English abstract.)--An annotated list of occasional species observed at Crozet Island. These include the Royal Penguin, the Chinstrap Penguin, Antarctic Fulmar, Ruddy Turnstone, Greenshank, Broad-billed Roller, and Barn Swallow.

Barrat, A., and J.L. Mougin. 1974. [Quantitative zoogeography of the antarctic and subantarctic avifauna.] In Ecological and physiological research on the fauna of French southern and antarctic lands. C.N.F.R.A. no. 33:1-18. (In French with English summary.)--A quantitative analysis, emphasizing coefficients of community, of the affinities among various austral locales. Twelve provinces are defined; these are clustered in turn into five superprovinces, two subregions, and one region. Factors defining these areas include changes in pack-ice, surface water zones, influence of dominant west winds, and geographical proximity. Contrary to what might be expected, the procellariiforms actually contribute to the division of the southern area into well-defined superprovinces.

Bougaeff, S. 1974. [Ecological observations of the Emperor Penguin colony at Pointe Géologie (Adélie Land) in 1970.] In Ecological and physiological research on the fauna of French southern and antarctic lands. C.N.F.R.A. no. 33:89-98. (In French with English summary.)--Breeding phenology and number of breeding birds observed during this study show remarkable consistency when compared with observations taken over the previous 20 years. Egg mortality was studied; 93% of eggs deserted were found to be infertile. Access to the colony at the beginning of the breeding season and exact breeding sites were variable; movement of the entire colony during the breeding cycle was apparently wind-induced.

Bougaeff, S. 1974. [Comparative study of several physiological parameters in two species of antarctic penguins, the Emperor Penguin Aptenodytes forsteri and the Adelie Penguin Pygoscelis adeliae.] In Ecological physiological research on the fauna of French southern and antarctic lands. C.N.F.R.A. no. 33:99-110. (In French with English summary.)--Internal temperatures and cardiac frequencies were recorded continuously and compared between Adelie and Emperor Penguins. Cardiac rhythm was 80 beats/min for the Emperors and 140 beats/min for Adelies, varying with respiratory rhythm and chill factor. Stomach temperatures were 38.5°C for Emperors and 40.0°C for Adelies; no variation with ambient temperatures nor circadian rhythm was observed. Leg and flipper temperatures showed considerable variation with activity and air temperature.

Derenne, P., J. Prevost, and M. Van Buren. 1972. [Bird banding in the Kerguelen Archipelago since 1951.] L'Oiseau et le Revue française d'ornithologie 42:111-129. (In French with English summary.)--Basically a survey of the numbers and specis of birds banded near Port-aux-Français on the principal island of the Kerguelen Archipelago. The majority of banded birds belonged to the Spheniscidae, Diomedeidae (Diomedea exulans), and Procellariidae (Macronectes halli).

Derenne, P., J. X. Lufbery, and B. Tollu. 174. [Avifauna of the Kerguelen Archipelago.] In Ecological and physiological research on the fauna of French southern and antarctic lands. C.N.F.R.A. no. 33:57-87. (In French with English summary.)--Species accounts and maps of resident avifauna of Kerguelen Islands; some population estimates are given (penguins, albatrosses, giant petrels). Includes a first record of the King Cormorant, Phalacrocorax albiventer.

Despin, B. 1972. [Preliminary note on the Gentoo Penguin of Possession Island (Crozet Archipelago).] L'Oiseau et la R.F.O. 42:69-83. (In French with English summary.)--A study of the breeding cycle of Gentoo Penguins on Possession Island.

Despin, B., J. L. Mougin, and M. Segonzac. 1972. [Birds and mammals of East Island.] C.N.F.R.A. no. 31:1-106, 6 plates. (In French with English summary.)--A fairly comprehensive review of the avifauna of East Island, Crozet Archipelago, during winter 1970-1. Breeding locations, breeding phrenology, and feeding habits are discussed. The annual cycle of mammal and avian use of the island is described, and the effect of introduced predatory mammals upon the avifauna is discussed.

Jouventin, P. 1971. [Behavior and social structure in the Emperor Penguin.] La terre et la vie no. 25. 78 pp., illus. (In French with English summary.)--"A study of the ecology, behavioral repertoire, and social structure of the Emperor Penguin (Aptenodytes forsteri) was undertaken during the 1969 breeding cycle at Pointe Géologie, Adélie Land (Antarctica)." Daily observations of 440 banded birds were made, and particular behaviors were analyzed from a classic ethological viewpoint. Special attention was devoted to "releaser" signals, lack of real territorial behavior, and other behaviors (or their absence) which might promote reproductive isolation. The author concluded that Emperor Penguin behaviors are best viewed in light of social thermoregulation, a necessary adaptation to the extreme cold.

Jouventin, P. 1971. [Nomadic incubation and chick-rearing among the Emperor Penguins of Pointe Géologie, (Adélie Land).] Rev. Comp. Animal 5:189-206. (In French with English summary.)--The regular movements of breeding colonies of Emperor Penguins within their breeding areas are interpreted as a response to wind, which drives the colony before it. Because adults carrying eggs or chicks are not as mobile as nonbreeding individuals, the birds cannot regain lost ground. This interpretation and previous ones (that nomadism is a response to pack-ice breakup) are compared and evaluated.

Jouventin, P. 1972. [Notes on the existence and significance of rhythmicity in mutual displays.] Alauda 40:56-62. (In French with English summary.)--Studies of Emperor Penguin mutual displays indicate that these displays are given at semiregular intervals. They may facilitate cooperation and synchronization between mated birds.

Jouventin, P. 1972. [A new acoustic recognition system among birds.] Behaviour 43:176-85. (The French with English summary.)--Spectrographic examination of the song of the Emperor Penguin showed temporal patterning of wave-trains to be the basis of sexual and individual recognition. Such temporal individuality appears to operate among several other species of colonial seabirds.

Mougin, J. L. 1972. [Continuous recording of the internal temperatures of Spheniscidae. I. The Gentoo Penguin Pygoscelis papua of Possession Island (Crozet Archipelago).] L'Oiseau et la R. F. O. 42:84-110. (In French with English summary.)--Measurements were made of both shell and core temperatures. Mean core temperature was 39.8°C and varied little; peripheral temperatures (foot and flipper) were lower (30°C) and varied with ambient temperatures and the birds' weight. Maintenance of these body temperatures would require about 150 g of fatty tissue catabolism/24 hrs, or 2.1% of the birds' body weight.

Mougin, J. L. 1974. [Continuous recording of the internal temperatures of Spheniscidae. II. The King Penguin (Aptenodytes patagonica) of Possession Island (Crozet Archipelago).] C.N.F.R.A. 33:29-56. (In French with English summary.)--Measurements were made of both shell and core temperatures. Mean core temperature was 39.1°C and varied little; peripheral temperatures (foot and flipper) were lower and more variable, depending both on chill factor and body weight (fat stores). Maintenance of high internal temperatures would require the catabolism of fatty reserves equivalent to 1.7% of body weight/24 hrs. Temperatures are higher and rate of weight loss greater among smaller penguins and chicks.

Prevost, J. 1961. [Ecology of the Emperor Penguin.] Actualités scientifiques et industrielles 1291 [Recent events in science and industry Hermann, Paris. 204 pp., 24 plates. (In French with English summary.)--A comprehensive study of Emperor Penguin breeding ecology, based on two seasons' data (1952, 1956) from Pointe Géologie, Adélie Land, Antarctica. The fasting cycle and physiology, social thermoregulation, mating and aggressive behavior, egg mortality, incubation and chick rearing, and population dynamics are treated in chapter subsections. The last chapter compares the reproductive cycle of King Penguins (Aptenodytes patagonica) with that of A. forsteri and discusses the evolution of certain behaviors in the two species.

Prevost, J. 1963. [Influence of bioclimatic factors on Emperor Penguin nomadism at the Pointe Géologie colony]. L'Oiseau et la R.F.O. 33:89-120. (In French with English summary.)--Emperor Penguins at Pointe Géologie successively occupy a series of five locales within their breeding area; their movements follow about the same pattern each year during the nine months penguins are on shore. Climatic factors and pack-ice breakup are the determining factors in this movement. Individual penguins are more or less sensitive to these factors according to their stage in the reproductive cycle. (But see Jouventin, P. 1971. Rev. Comp. Animal 5:189-206.)

Sapin-Jaloustre, J. 1960. [Ecology of the Adelie Penguin.] Actualités scientifiques et industrielles 1270. Hermann, Paris. 211 pp., 32 plates. (In French with English summary.)--One of the early complete studies of Adelie Penguin breeding ecology (1948-51), including descriptions of behavior, the annual cycle, chick development, and social structure in relation to problems of thermoregulation.

Segonzac, M. 1972. [Recent data on the fauna of St. Paul and New Amsterdam islands.] L'Oiseau et la R.F.O. 42:3-68. (in French with English summary.)--Species accounts of the bird and mammal fauna of St. Paul and New Amsterdam islands, Indian Ocean. The effect of human disturbance and other possible reasons for the paucity of bird life on these islands are briefly discussed.

Shuntov, V. P. 1964. [Transequatorial migrations of the Short-tailed Shearwater, Puffinus tenuirostris (Temm.).] Zool. Zh. 43:590-8. (In Russian.)--The "figure-eight" migration of P. tenuirostris is correlated with zones of oceanic productivity. The transequatorial migration of this seabird is considered an adaptation for utilizing the food resources of the most productive waters of the temperate zones of both hemispheres, the maximum food abundance of which occurs at opposite seasons.

# GALAPAGOS SEABIRDS: OPPORTUNITIES FOR RESEARCH

With 19 resident and over 20 migrant species of seabirds, the Galapagos Islands of Ecuador offer a wealth of research opportunities for the biologist. Snow, Leveque, Nelson, Harris, DeVries, Boersma, and numerous Ecuadorian students have made inroads into many topics but have also inevitably raised as many questions as they answered. This report will try to provide a sampling of some of the topics that await investigation.

## Blue-footed Booby

It is ironic that the most conspicuous and one of the tamest of Galapagos seabirds has been so little studied. The only substantial work has been a rather brief study by Nelson. He found an apparent major dimorphism between the sexes in the feeding of the young. Male boobies, apparently adapted to catching small fish close to shore, feed the young when they are small, making frequent trips. Later, as the food requirements of the young increase, the larger female takes over, bringing fewer but larger fish, presumably gathered farther offshore. Is Nelson's model valid? Does the brood size affect the division of labor? Does the male desert after his feeding efforts are over and the young are large enough to be left by themselves?

What is the function of group-diving in Blue-foots? Why is it that adjacent colonies of Blue-foots (e.g., Seymour Norte and Daphne Major), separated only by a few kilometers, may have markedly different breeding seasons?

## Other Boobies

Is there assortative mating in Red-footed Boobies between color phases? Do the frequencies of the morphs vary within the archipelago and have they varied since counts by previous workers? Do the morphs differ in their breeding seasons? What are the genetics of the polymorphism?

Is fratricide in young White Boobies genetically controlled or mediated by hunger? Do young Red-footed Boobies, which invariably come from single-egg clutches, retain aggressive tendencies to artificial twins? Comparisons among the three boobies in brood reduction would be interesting.

Nelson (1978, The Sulidae) concluded that Red-foots nest in large colonies on the outside of the archipelago and presumably feed a great distance away. White Boobies feed among the islands and nest in much smaller colonies, whereas Blue-foots feed closer to shore, generally (but not always) in small colonies. One expects the growth and nesting success of Blue-foots to be the most variable, reflecting local differences in food availability. Red-foots should show the least difference, all presumably feeding far offshore in the same places. For Blue-foots, can differences be related to differences in productivity of the various currents flowing through the archipelago?

Waved Albatross

This species seems not to have a permanent nest site but to shift its egg around. Why? After ten years of banding, adults of known age are available for studies of pair-bonding, nesting success, and growth of young.

Brown Pelican

A preliminary study of pelicans in the Galapagos met with difficulties when the birds deserted (Noticias de Galapagos No. 27). Two years later I found abundant remains of ticks in the bottom of old pelican nests in the same location. As ticks have been responsible for desertions of pelicans in other areas, an investigation of parasitism or indeed any aspect of this bird species might be interesting.

Great Frigate-bird

From Nelson's studies it sounds almost as if this species forms leks of displaying males. Why are some males chosen first?

Flightless Cormorant

This strongly sedentary species nests only on the islands Isabela and Fernandina; why? An inshore feeder rarely straying far from its nest site, it offers an incredible opportunity to study the relation between feeding and breeding in individual pairs. Is food in short supply while breeding? What is the relation between competence in feeding and nesting success? What changes in the marine environment cause this species to have a seasonal breeding cycle?

Lava Gull

Except for a behavioral study by Snow, there has been no work done on this gull, one of the world's rarest.

Birds at Sea

The Galapagos archipelago is swept by the Humboldt Current from the east, the Cromwell Current from the west, with the Equatorial Front moving south through the inlands during the northern winter. There are numerous areas of local upwelling. Water masses show differences in temperature and salinity. An interesting study of seabird distribution in relation to wind and water masses could be carried out.

Feeding flocks occur over tuna, whales, porpoise, and plankton patches. Which species feed over what? How important are interspecific interactions, including food piracy? How do these groups start, or end?

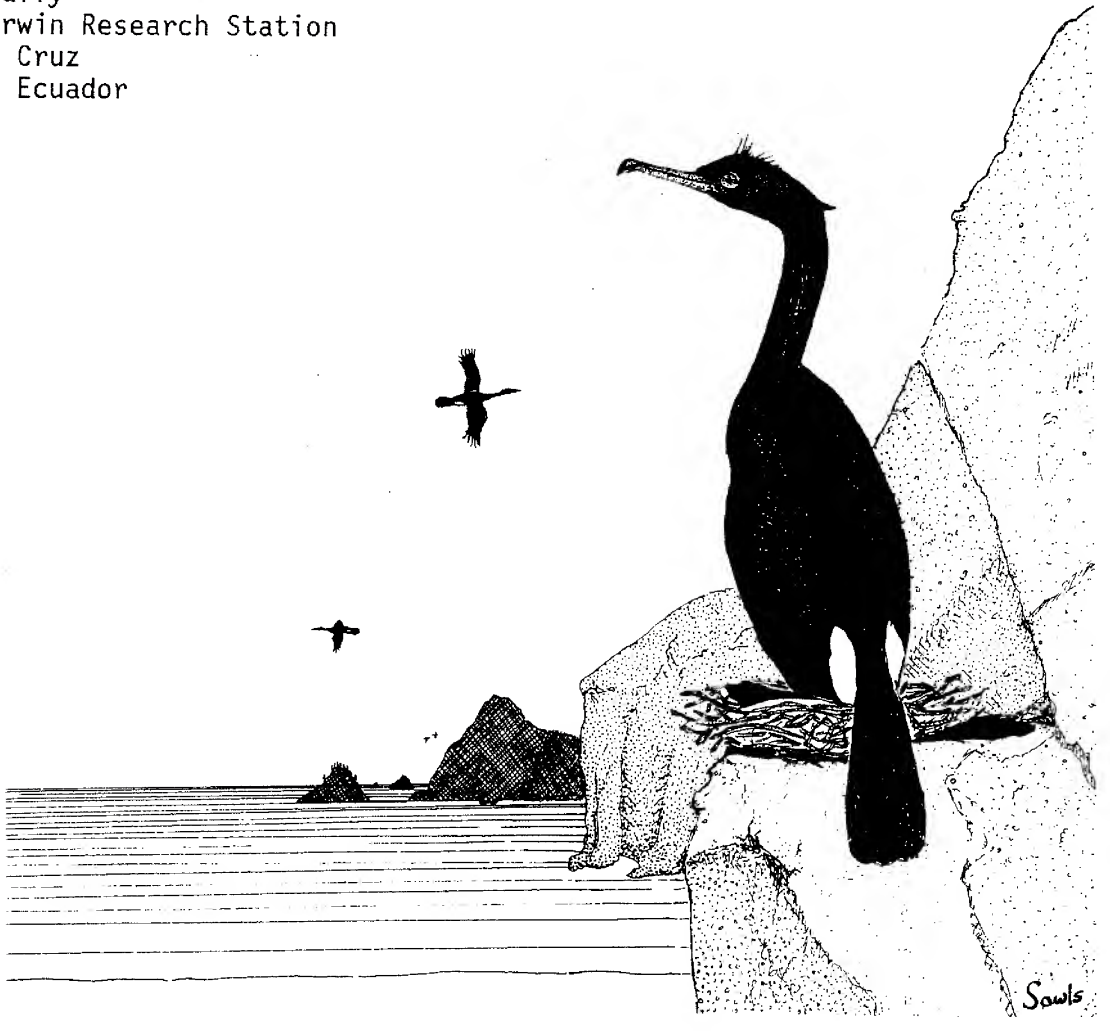
A quick look at any of the Galapagos seabird literature will raise more questions. While the islands can provide projects in abundance, funding is as scarce as anywhere else. Some funds might be available for conservation work on the endangered Dark-rumped (Hawaiian) Petrel, but otherwise, the

would-be researcher is on his or her own. The Organization of American States offers fellowships to citizens of O.A.S. countries. The Frank Chapman Memorial Fund of the American Museum of Natural History and the National Geographic Society are interested in considering applications for funding. National research bodies such as N.S.F. or foreign aid programs might also accept applications.

Once the obstacle of funding is overcome, the Darwin Station can provide information on permits from the Servicio Nacional de Parque Galapagos; the latter differs from at least some parks in recognizing the importance of scientific research and actively encouraging projects as long as they do not conflict with the well-being of the Galapagos environment. In addition, the Darwin Station can considerably reduce the difficulties of obtaining food, water, transportation, and can give advice on the best sites to work at.

The basic biology of many (but not all) Galapagos seabirds is already known, but there remains a second generation of projects for the biologist willing to venture farther afield. In North America and Europe seabird biologists sometimes seem to outnumber seabirds, but in the Galapagos one worries less about defining or defending a research niche than about how to take advantage of the opportunities.

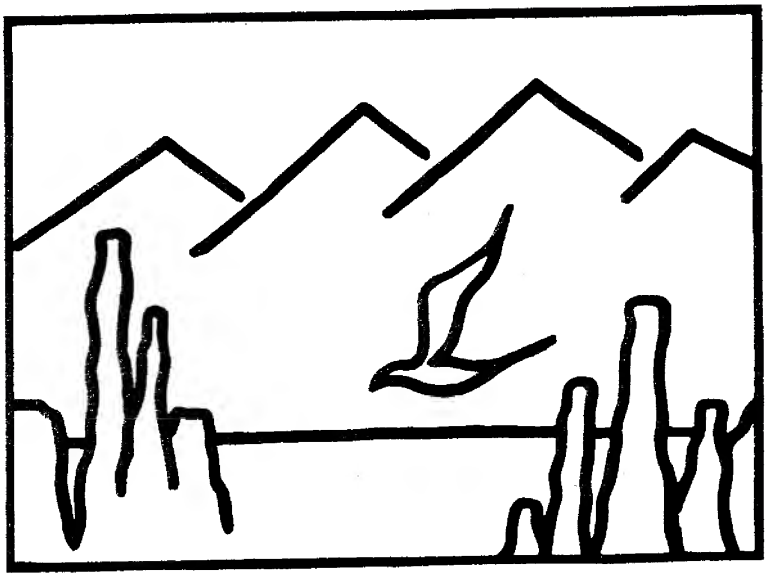
David C. Duffy
Charles Darwin Research Station
Isla Santa Cruz
Galapagos, Ecuador



STATUS OF THE SHORT-TAILED ALBATROSS

The latest information on the Short-tailed Albatross: Our researcher had a rare chance to land Tori-shima last November and March; counted 130 adults, the highest number since its rediscovery. About 50 nests in November; 20 chicks in March. Urgently need habitat preservation (vegetation) and rat control.

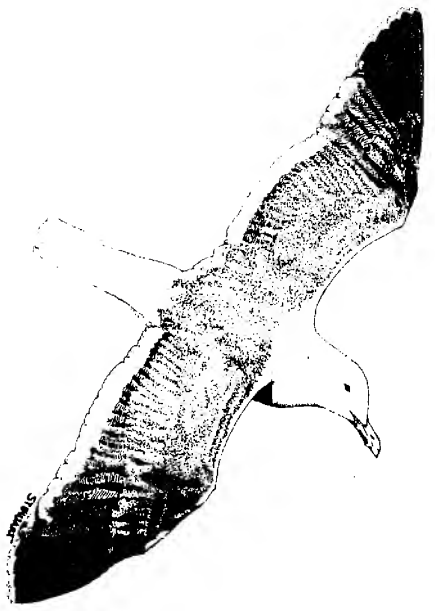
Yozo Tsukamoto
Wild Bird Society of Japan
27 May 1980



The Sierra Nevada Mountains, high deserts, an inland sea named Mono Lake, and a description of the lake's ecosystem, including springs, calcium tufa towers, brine shrimp, and sea gulls. The diversion of snow melt streams and the effects of lowering water level are chronicled in this fast-paced, informative documentary narrated by Lee Whiting and filmed by Michael Beaucage.

Available in 16mm for $90, postage and handling included. Please write for rental or videotape information.

AURORA PRODUCTIONS, P.O. Box 7108, Berkeley, CA 94707



NEW MEMBERS

Donald J. Hansen
3103 W. 31st Ave, #8
Anchorage, AK 99503

Wildlife biologist
Interests: Distribution, population status, reproductive capacity, and sensitivity to human activities

L. Howell
c/o P.O. Box 144
Kieta NSP
Papua New Guinea

Civil engineer
Interests: South Pacific petrels

Klaus O. Richter
11040 104th Ave. NE
Kirkland, WA 98033

Terrestrial ecologist
Studies: Nest site selection in Western and Glaucous-winged Gulls
Interests: Evolutionary aspects of gull ecology, nest site selection, hybridization

David S. Lee
North Carolina State Museum
P.O. Box 27647
Raleigh, NC 27611

Curator
Studies: Surveys and natural history of species off the North Carolina coast
Interests: Distribution, feeding, molt, parasites, mercury loads